Listing of Claims

This listing of claims will replace all prior versions, and listings, of claims in the application:

Claim 1. (currently amended) A method for resetting bus segments to clear bus hang in an I/O subsystem having a plurality of bus segments, each bus segment having a set of devices and a bus that is coupled to the set of devices, the I/O subsystem having at least one expander, each expander being arranged to couple a pair of buses for propagating communication signals, a first of the bus segments being coupled by a first one of the expanders only to a second of the bus segments, the method comprising the operations of:

a) asserting a first reset signal on only the ~~a~~ first bus segment in a manner by which the first reset signal is normally transmitted through the first expander to the second bus segment;

b) in response to the first reset signal asserted on the first bus segment, resetting the first ~~each~~ expander coupled to the first bus segment and resetting each device in the first bus segment ~~in response to the reset signal,~~ and establishing a first reset isolation mode of the first expander to perform ~~wherein each expander coupled to the first bus segment isolates the~~ reset signal isolation such that the first reset signal is not propagated through the first expander to the second ~~other~~ bus segment ~~segments; and~~

c) ~~for~~ operating the first ~~each~~ expander coupled to the first bus segment for~~,~~ :

c1) after resetting the first expander and the devices in the first bus segment, in a segment isolation mode of the first expander, isolating all the

communication signals such that the first ~~each~~ expander prevents propagation of the communication signals between the first bus segment and the second ~~other~~ bus segment wherein a busy signal from the second bus segment will not propagate to the first bus segment and will not interrupt clearing of the first bus segment ;

c2) determining whether the bus of the second ~~other~~ bus segment is no longer hung;

c3) during the first reset isolation mode, if the ~~other~~ bus of the second bus segment is still hung, issuing a first far-side reset signal on the ~~other~~ second bus segment to reset the ~~other~~ second bus segment, propagation of the first far-side reset signal to the reset first bus segment being prevented by the first expander in the first reset isolation mode; ~~and~~

c4) if the ~~other~~ bus of the second bus segment is not hung, allowing propagation of the communication signals between the first bus segment and the second ~~other~~ bus segment; and

c5) ending the first reset isolation mode of the first extender.

Claim 2. (currently amended) The method as recited in claim 1, wherein a third of the bus segments is coupled by a second of the expanders only to the second bus segment, and if the bus of the second ~~other~~ bus segment is still hung, ~~operations b) and c) are repeated for other expanders coupled to each of the buses~~ the method further comprises the following operations:

d) in response to the first far-side reset signal on the second bus segment,

resetting the second expander coupled to the second bus segment and resetting each device in the second bus segment and establishing a second reset isolation mode of the second expander to perform far-side reset signal isolation such that the first far-side reset signal is not propagated through the second expander to the third bus segment.

Claim 3. (original) The method as recited in claim 1, wherein each expander enters into a reset isolation mode in response to the respective reset signal.

Claims 4 and 5. (canceled)

Claim 6. (currently amended) The method as recited in claim 1, wherein a third of the bus segments is coupled by a second of the expanders only to the second bus segment, a host computer in the I/O subsystem on the first bus segment asserts the first reset signal only on the first bus segment, and the first expander in the first reset isolation mode isolates the first reset signal from being propagated through the first expander to the second and third bus segments.

Claim 7. (currently amended) The method as recited in claim 1 [4], wherein the first ~~each~~ expander exits the segment isolation mode so that when the second ~~other~~ bus is not hung the first expander allows ~~to allow~~ the propagation of communication signals between the first bus segment and the second ~~other~~ bus segment.

Claim 8. (currently amended) The method as recited in claim 7, wherein a third of the bus segments is coupled by a second of the expanders only to the second bus segment, the method comprising the further operations of:

after the first expander exits the segment isolation mode and in further response to the first far-side reset signal on the second bus segment, establishing a second reset isolation mode of the second expander to perform reset signal isolation such that the first far-side reset signal is not propagated through the second expander to the third bus segment; and

during the second reset isolation mode, if the bus of the third bus segment is still hung, issuing a second far-side reset signal on the third bus segment to reset the third bus segment, propagation of the second far-side reset signal to the reset second bus segment being prevented by the second expander in the second reset isolation mode;

wherein the first, second and third bus segments are reset one bus segment at a time starting with resetting ~~from~~ the first bus segment and then resetting the second bus segment and then resetting the third bus segment.

Claim 9. (currently amended) An expander device for isolating a reset between a pair of bus segments in an I/O subsystem, each bus segment having a set of devices and a bus that is coupled to the set of devices, the expander device being arranged to couple the respective bus of a first bus segment of the pair only to the respective bus of a second bus segment of the pair for communication in the I/O subsystem, the expander device comprising ~~including~~:

a first I/O interface circuit configured to be coupled to the first bus segment, the first I/O interface circuit being adapted to interface input and output communication signals with the first bus segment;

a second I/O interface circuit configured to be coupled to the second bus segment and being adapted to interface the input and output communication signals with the second bus segment; and

a first ~~an~~ expander controller arranged to communicate the input and output communication signals between only the first and second I/O interface circuits, ~~the first expander controller being configured to control communication between the first and second bus segments,~~ the first expander controller including a first reset and segment isolation controller coupled between only the first and second I/O interface circuits and adapted to isolate a reset signal received by the expander controller from ~~on~~ the first bus segment through the first I/O interface circuit and to the first reset and segment isolator controller so that the reset signal does not propagate through the second I/O interface circuit ~~from propagating~~ to the second bus segment, the first reset and segment isolation ~~expander~~ controller being further adapted to cause the I/O interface circuits to isolate ~~isolates~~ all signals to prevent propagation of the signals between the first and second bus segments during a period after isolating the reset

signal until the bus in the first ~~second~~ bus segment is cleared from a hang condition.

Claim 10. (currently amended) The expander device as recited in claim 9, wherein the first expander controller is adapted to be reset ~~the expander device~~ in response to the reset signal and wherein all devices in the first bus segment reset in response to the reset signal such that the bus in the first bus segment is cleared from the hang condition.

Claim 11. (currently amended) The expander device as recited in claim 9, wherein after clearing the first bus segment, if the bus in the second bus segment is still hung, the first expander controller issues a far-side reset signal to the bus in the second bus segment to reset the second bus segment, and the isolation of the reset signal prevents the propagation of the far-side reset signal to the first bus segment to prevent resetting of the devices in the first bus segment .

Claim 12. (currently amended) The expander device as recited in claim 9, wherein the first expander controller allows propagation of all signals between the first and second bus segments when the bus in the second bus segment is cleared from the hang condition.

Claim 13. (currently amended) The expander device as recited in claim 9, wherein the first reset and segment isolation controller is further adapted to determine, after the period, whether the bus of the second bus segment is hung, and if not hung, to

cause the I/O interface circuits to allow propagation of all the signals between the first and second bus segments ~~the expander controller enters into a reset isolation mode in response to the reset signal. through 17~~ .

Claims 14 through 17. (canceled)

Claim 18. (currently amended) The expander device as recited in claim 11 ~~9~~, wherein the expander device isolates a second reset between a second pair of bus segments in the I/O subsystem, the expander device further being arranged to couple the respective bus of the second bus segment only to the respective bus of a third bus segment of the second pair for communication in the I/O subsystem, the expander device further comprising:

a third I/O interface circuit configured to be coupled only to the second bus segment, the third I/O interface circuit being adapted to interface input and output communication signals with the second bus segment;

a fourth I/O interface circuit configured to be coupled only to the third bus segment and being adapted to interface the input and output communication signals with the third bus segment; and

a second expander controller arranged to communicate the input and output communication signals between only the third and fourth I/O interface circuits, the second expander controller including a second reset and segment isolation controller coupled between only the third and fourth I/O interface circuits and adapted to isolate the far-side reset signal received on the second bus segment so that the far-side reset

signal does not propagate through the fourth I/O interface circuit to the third bus segment, wherein the second reset and isolation controller is further adapted to cause the third and fourth I/O circuits to isolate all signals to prevent propagation of all the signals between the second and third bus segments during a second period after isolating the far-side reset signal until the bus in the second bus segment is cleared from a hang condition;

wherein the first and second bus segments are reset one bus segment at a time starting with ~~from~~ the first bus segment~~,~~ and continuing to the hung second and third bus segment, wherein all of the resetting of the first, second, and third bus segments is in response to the first reset signal that was received on the first bus segment .

Claim 19. (currently amended) The expander device as recited in claim 18 ~~9~~, wherein if the buses of the respective first and second bus segments are hung, then one after the other each of the respective first and second reset and segment isolation controllers ~~controller~~ generates a respective far-side reset isolation signal, which is provided to reset respective output buffers in the respective ~~first and second~~ I/O interface circuits to disable propagation of the respective far-side reset signal from the first I/O interface circuit to the first bus segment and to disable propagation of the respective far-side reset signal from ~~to~~ the ~~first and second bus~~ third I/O interface circuit to the third bus segment ~~segments.~~

Claim 20. (canceled)

Claim 21. (currently amended) An SCSI expander for resetting bus segments to clear bus hang in an SCSI I/O subsystem, each bus segment having a set of devices and a bus that is coupled to the set of devices, the SCSI expander being arranged to couple a first bus in a first bus segment and a second bus in a second bus segment, the SCSI expander being configured to repeat communication signals by receiving the communication signals from one SCSI bus segment and outputting the communication signals to the other SCSI bus segment, the SCSI expander comprising:

a first SCSI I/O interface circuit adapted to interface communication signals with the first SCSI bus segment;

a second SCSI I/O interface circuit adapted to interface the communication signals with the second SCSI bus segment; and

an SCSI expander controller coupled to communicate the communication signals between only the first and second SCSI I/O interface circuits, ~~the SCSI expander controller being arranged to control communication between the first and second SCSI bus segments,~~ the SCSI expander controller including a first reset and segment isolation controller coupled between only the first and second SCSI I/O interface circuits and adapted to operate in a reset isolation mode to isolate a reset signal received by the SCSI expander controller from ~~on~~ the first bus segment through the first SCSI interface circuit and to the first SCSI interface circuit and to prevent the reset signal from propagating to the second bus segment whether or not the second bus segment is in a bus hung condition, wherein the SCSI expander controller also operates in a segment isolation mode to isolate ~~isolates~~ all communication signals to prevent propagation of the communication signals between the first and second bus

segments during a period after isolating the reset signal until the first ~~second~~ bus is in a BUS FREE state.

Claim 22. (currently amended) The SCSI expander as recited in claim 21, wherein the SCSI expander controller is adapted to be reset ~~the SCSI expander~~ in response to the reset signal and wherein all devices in the first bus segment reset in response to the reset signal such that the first bus is in the BUS FREE state.

Claim 23. (currently amended) The SCSI expander as recited in claim 21, wherein if the second bus is still hung after the SCSI expander controller exits the segment isolation mode and during the reset isolation mode, the SCSI expander controller issues a far-side reset signal, the SCSI expander controller in the reset isolation mode allowing the far-side reset signal to be communicated to the second bus to reset the second bus segment and preventing the far-side reset signal from being communicated to the first bus segment wherein the far-side reset signal does not reset the first bus segment.

Claims 24 through 28. (canceled)

Claim 29. (currently amended) The SCSI expander as recited in claim 21, wherein:

the SCSI I/O subsystem includes a third bus segment having a third bus, and

the SCSI expander is configured to couple the second bus in the second bus segment and the third bus in the third bus segment, the SCSI expander further

comprising:

respective third and fourth SCSI I/O interface circuits adapted to interface communication signals with the respective second and third SCSI bus segments; and

an other SCSI expander controller coupled to communicate the communication signals between the third and fourth SCSI I/O interface circuits, the other SCSI expander controller being arranged to control communication between the second and third SCSI bus segments, the other SCSI expander controller including an other reset and segment isolation controller coupled between only the third and fourth SCSI I/O interface circuits and adapted to isolate a far-side reset signal received on the second bus segment to prevent the far-side reset signal from propagating to the third bus segment, wherein the first and second bus segments are reset one bus segment at a time starting with ~~from~~ the first bus segment and next to the second bus segment, wherein all the resets are in response to the reset signal received on the first bus segment.

Claim 30. (new) The method as recited in claim 6, further comprising the operations of:

after resetting of the first and second bus segments, performing the following operations:

d) in response to the first far-side reset signal asserted on the second bus segment, resetting the second expander coupled to the second bus segment and establishing a second reset isolation mode of the second expander to perform reset signal isolation such that the first far-side reset signal is not propagated through the

second expander to the third bus segment; and

e) operating the second expander coupled to the second bus segment for:

e1) after resetting the second expander and the devices in the second bus segment, in a second segment isolation mode of the second expander, isolating all the communication signals such that the second expander prevents propagation of the communication signals between the second bus segment and the third bus segment, wherein a busy signal from the third bus segment will not propagate to the first bus segment and will not interrupt clearing of the first bus segment ;

e2) determining whether the bus of the third bus segment is no longer hung; and

e3) during the second reset isolation mode, if the bus of the third bus segment is still hung, issuing a second far-side reset signal on the third bus segment to reset the third bus segment, propagation of the second far-side reset signal to the reset second bus segment being prevented by the second expander in the second reset isolation mode.